SCHEME FOR EXAMINATION B.TECH (FOUR YEAR) DEGREE COURSE
COMPUTER SCIENCE AND ENGINEERING
SCHOOL OF STUDIES IN ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA
THIRD YEAR, SEMESTER - V & VI
W.E.F. SESSION 2024-25 [NEP]

Branch: - Computer Science & Engg. **Year: - III** **Sem: - V**

S.No	Code no.	Subject	Periods/Week			Evaluation Scheme			Credits
			L	T	P	IA	ESE	Total	
1.	CSUETT1	Relational Database Management System	3	0	0	40	60	100	3
2.	CSUETT2	Parallel Computing	3	1	0	40	60	100	4
3.	CSUETT3	Formal Language and Automata Theory	3	0	0	40	60	100	3
4.	CSUETKX	----------	3	0	0	40	60	100	3
5.	CSUETKX	----------	3	0	0	40	60	100	3
	PRACTICAL								
1.	CSUELT1	Relational Database Management System Lab	0	0	3	25	25	50	1.5
2.	CSUELT2	Parallel Computing Lab	0	0	3	25	25	50	1.5
3.	CSUEPV1	Mini Project	–	–	4	50	50	100	2
Total			15	1	10	300	400	700	21

Departmental Electives

S.No.	Course Code	Subject Name	Credits
1.	CSUETK1	Microprocessor and Interfaces	3
2.	CSUETK2	Software Engineering	3
3.	CSUETK3	Multimedia System Design	3
4.	CSUETK4	Software Testing and Quality Assurance	3
5.	CSUETK5	Distributed System	3
6.	CSUETK6	Information Retrieval Systems	3

Branch: - Computer Science & Engg. **Year: III** **Sem: - VI**

S.No	Code no.	Subject	Periods/Week			Evaluation Scheme			Credits
			L	T	P	IA	ESE	Total	
1.	CSUFTT1	Design and Analysis of Algorithms	3	0	0	40	60	100	3
2.	CSUFTT2	Java	3	0	0	40	60	100	3
3.	CSUFTT3	Artificial Intelligence	3	0	0	40	60	100	3
4.	CSUFTKX	----------	3	0	0	40	60	100	3
5.	CSUFTKX	----------	3	0	0	40	60	100	3
6.	MOOC Course-I	----------	3	0	0	40	60	100	3
	PRACTICAL								
1.	CSUFLT1	Design and Analysis of Algorithms Lab	0	0	3	25	25	50	1.5
2.	CSUFLT2	Java Lab	0	0	3	25	25	50	1.5
3.	CSUFPV1	Project	0	0	4	50	50	100	2
Total			**18**	**00**	**10**	**340**	**460**	**800**	**23**

Departmental Electives

S.No.	Course Code	Subject Name	Credits
1.	CSUFTK1	Digital Image Processing	3
2.	CSUFTK2	Computer Graphics	3
3.	CSUFTK3	Mobile Communication	3
4.	CSUFTK4	Robotics	3
5.	CSUFTK5	Visual Basic.Net	3
6.	CSUFTK6	Big Data Analysis	3

Sub Title: RELATIONAL DATABASE MANAGEMENT SYSTEM		
Sub Code: CSUETT1	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. To understand the Introduction of RDBMS
2. To study the SQL Framework.
3. To understand Functional Dependencies and Normalization
4. To understand the Transaction Processing Concepts
5. To study the Concurrency Control Techniques

Unit No.	Syllabus Content	Number of Hours
1	**Introduction:** An overview of database management system, database system Vs file system, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database Structure. Data Modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.	**10**
2	**Relational Data Model and Language:** Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus, Introduction to SQL: Characteristics of SQL. Advantage of SQL. SQL data types and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations. Joins, Unions, Intersection, Minus, Cursors in SQL.	**10**
3	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.	**10**
4	**Transaction Processing Concepts:** Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log-based recovery, checkpoints, deadlock handling.	**10**
5	**Concurrency Control Techniques:** Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation-based protocol, multiple granularities, Multi version schemes, Recovery with concurrent transaction.	**10**

COURSE OUTCOMES: The students would have learn

CO 1: Describe the various RDBMS basic Concepts.
CO 2: Understand the working of the SQL framework.
CO 3: Evaluate the various Types of Functional Dependencies and Normalization.
CO 4: Identify the Transaction Processing Concepts.
CO 5: Identify the Concurrency Control Techniques.

Text Books:

1. Date C J, “An Introduction to Database System”, Addison Wesley.
2. Korth, Silbertz, Sudarshan, “Database Concepts”, McGraw Hill.
3. Elmasri, Navathe, “Fundamentals of Database Systems”, Addison Wesley.
4. Leon & Leon, “Database Management System”, Vikas Publishing.

Reference Books:

1. Bipin C. Desai, “An introduction to Database Systems”, Galgotia Publication.
2. Majumdar & Bhattacharya, “Database Management System”, TMH.
3. Ramakrishnan, Gehrke, “Database Management System”, McGraw Hill.
4. Kroenke, “Database Processing: Fundamentals, Design and Implementation”, Pearson Education.
5. Maheshwari Jain, “DBMS: Complete Practical Approach”, Firewall Media, New Delhi.

Sub Title: PARALLEL COMPUTING		
Sub Code: CSUETT2	**No. of Credits: 4=3:1: 0(L-T-P)**	**No of lecture hours/week :04**
Exam Duration: 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. To introduce parallel, distributed and cloud computing, the major concept, ideas and various hardware model of parallel and distributed system.
2. To study design the multiprocessor system by various interconnection network like staticand dynamic etc.
3. To study various technique for vector pipeline architecture design to achieve parallelism (concurrency)
4. To study about advanced and more power full processor technology
5. To study about parallel algorithm design, programming language and tools like Python, CUDA. To study about architecture design of GPU.

Unit No.	Syllabus Content	Number of Hours
1	**Introduction Of Parallelism:** Introduction -parallelism in Uniprocessor systems, Principles of Scalable Performance, architectural classification schemes, SISD, SIMD, MISD, MIMD architectures, multiprocessor and multicomputer, UMA, NUMA, COMA, NORMA model Parallel algorithms: Various Soritng.	**8**
2	**Parallel Models & Interconnection Network:** System Interconnect architecture – static, dynamic, multistage interconnection networks, design considerations throughputs, delay, blocking and non-blocking properties interconnected memory organization - C-Access, S-Access, C-S access.	**7**
3	**Pipeline & Vector Processing:** Principal of Pipelining - Over lapped parallelism, principal of Liner pipelining processor, General pipelining and reservation tables, arithmetic pipelining, Design of pipeline Instruction units, arithmetic pipelining design example, hazard detection and resolution, JOB sequencing and collision prevention, vector processing function organization of instructions in IBM 360/91.	**7**
4	**Advanced Processor and Parallelism:** Advanced processor technology – RISC & CISC computers, super scalar architecture, principles of multithreading, multithreaded architectures of MP systems. Context switching policies, shared variables, locks, semaphores, monitor, multitasking and Cray multiprocessor.	**7**
5	**Parallel Programming Design Coding And Dubugging:** CPU parallelism, GPU parallelism- program, Exploiting parallelism in programmed-multidimensional arrays, directed acyclic graphs, distance and direction vectors, data flowcomputer and data flow graphs. Parallel algorithm structure, analyzing parallel algorithm. Elementary parallel algorithms, Programming: Parallel programming with Synchronous and Asynchronous, Various API of MPS, PYTHON, CUDA, OpenCL.	**7**

COURSE OUTCOMES: The students would have learnt

CO 1: Spontaneously able to design the multiprocessor system with various hardware electronics circuit like CU, ALU, RAM etc.
CO 2: Design new interconnection network which connects the processors and other devices likeinput and output devices (I/O)
CO 3: Spontaneously try and invented a new type of pipeline processor architecture in which throughput can be as better as possible than all other.
CO 4: How do combine the techniques of parallelism to obtain a more power full architecture as a outcome.
CO 5: Course outcomes are skills and abilities to make parallel algorithm and program to enhancethe speed up of execution of process.

Text Books:

1. Computer Architecture & Parallel processing - Kai Hwang 7 Briggs.(MGH).
2. Advanced Computer Architecture with Parallel Programming", K. Hwang, MGH.
3. Quinn, Parallel computing – theory and practice, Tata McGraw Hill.
4. Sima and Fountain, Advanced Computer Architectures, Pearson Education
5. Ed. Afonso Ferreira and Jose' D. P. Rolin, Parallel Algorithms for irregular problems - Stateof the art, Kluwer Academic Publishers

Reference Books:

1. Parallel Computers: Arch.& Prog., Rajaraman & Siva Ram Murthy, PHI.
2. Parallel computing- Theory and practice - Michael J Quinn- Mc Graw Hill
3. Selim G. Akl, The Design and Analysis of Parallel Algorithms, PH International.

Sub Title: FORMAL LANGUAGE AND AUTOMATA THEORY		
Sub Code: CSUETT3	**No. of Credits: =3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. To learn fundamental of regular and Context Free Grammars and Language.
2. To understand the relation between Regular Language and Finite Automata and Machine.
3. To learn how to design Automata's and machine as Acceptors, Verifiers and Translators.
4. To understand the relation between Context free Language, PDA and TM
5. To learn how to design PDA as acceptor and TM as Calculators.

Unit No.	Syllabus Content	Number of Hours
1	**Introduction to Finite Automata:** Introduction to Finite Automata, Concepts of Automata Theory, Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), NFA with Epsilon Transition, Conversion of NFA to DFA.	**8**
2	**Regular Expressions:** Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions. Regular Expression to FA, DFA to Regular Expression, Arden Theorem, Pumping Lemma for Regular Languages, FA with Output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine.	**8**
3	**Context Free Grammar (CFG) & Context Free Languages (CFL):** Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Parse Tress, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages. Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFL.	**7**
4	**Push Down Automata (PDA):** Definition of the Pushdown Automaton, Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by Final State, Acceptance by empty stack, Deterministic Pushdown Automata. Equivalence of PDA and CFG, CFG to PDA and PDA to CFG.	**7**
5	**Turing Machines (TM):** Basic Model, Definition and Representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, Universal TM, Church's Thesis, Recursive and Recursively Enumerable Languages, Introduction to Undecidability, Undecidable Problems about TM. Post Correspondence Problem (PCP)**.**	**7**

COURSE OUTCOMES: The students would have learn

CO 1: Understand the concept of FA and their power to recognize the languages.
CO 2: Able to understand the concept of Regular Expression.
CO 3: Understand, design, analyze & interpret Context Free Languages, Expression & Grammars.
CO 4: Design different types of Push Down Automata.
CO 5: Able to understand the concept of Turing machines.

Text Books:

1. "Introduction to Automata Theory Languages and Computation", Hopcroft and Ullman, Narosa.
2. "Theory of Computer Science", Mishra and Chandra Shekharan, PHI.

Reference Books:

1. "Theory of Computer Science", Kohan, John Wiley.
2. "An Introduction to Automata Theory and Formal Languages", Adesh K. Pandey, S. K. Kataria & Sons.
3. "Introduction to Languages & Theory of Computation", Martin, TMH.

Sub Title: MICROPROCESSOR AND INTERFACES		
Sub Code: CSUETK1	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. To describe the basic architecture of 8086.
2. To discuss the Instruction set of 8086.
3. Understand the basic objective of Stack, Macro and Interrupt.
4. Develop knowledge about interfacing devices and peripheral devices.
5. To describe the basic architecture of 80386 and coprocessor.

Unit No.	Syllabus Content	Number of Hours
1	**Microprocessor Architecture** - 8086, Register organization of 8086, Signal descriptions of 8086 chip, Physical Memory organization, Introduction to Maximum and Minimum mode operation, Processor 8088.Introduction of Microcontroller, Compare salient feature of Microcontroller and Microprocessor	**7**
2	Instruction formats, addressing modes, Instruction Set of 8086: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Shift and rotate instructions, String Manipulation instructions, Machine Control Instruction, Flag Manipulation Instruction, Assembler Directive and Operators Programming with an Assembler, Programming examples.	**8**
3	Introduction to Stack, Stack Structure of 8086, Interrupt, Interrupt and Interrupt Service Routines, Non Maskable Interrupt, Maskable Interrupt. Subroutine, MACROS: Defining a MACRO, Passing Parameters to MACRO.	**7**
4	Memory Interfacing, Interfacing I/O Ports, Programmable Interval Timer 8253: Architecture and Signal Description, Operating modes, Programming and Interfacing 8253, DMA Controller 8257: Architecture and Signal Description, Keyboard/Display Controller 8279: Architecture and Signal Description, Mode of Operation,	**7**
5	**Multi microprocessor System:** Numeric Processor 8087, IO Processor 8089. 80386: Features, Architecture and Signal Description, Register Organization, Real Mode, Protected Mode, Virtual Mode, Paging, Segmentation.	**7**

COURSE OUTCOMES: The students would have learnt

CO 1: Learn about the basic architecture of 8086.
CO 2: Develop a skill to do Assembly Language Programming.
CO 3: Learn about the basics of Macro, Stack and Interrupts.
CO 4: Develop a understanding about the memory interfacing and peripheral devices.
CO 5: Learn about the basic of 80386 microprocessor and coprocessor.

Text Books & References:

1. Advanced Microprocessors and Peripherals – Architecture, Processing and Interfacing :A.K.Ray, K.M. Bhurchandi.
2. Microcomputer System 8086/8088 Family – Architecture Programming and design : Y Liu and G. A. Gibson : Prentice Hall.
3. 80386 Microprocessor Handbook C.H. Pappas and W. H. Murray :Osborne McGraw Hill.
4. Microprocessor Architecture Programming and Application : R.C. Gaonkar : Wiley Eastern.
5. Microprocessor8086 , 80386& Pentium , Barry B. Brey.

Sub Title: SOFTWARE ENGINEERING		
Sub Code: CSUETK2	**No. of Credits :3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. To discuss the fundamental concepts of Software Engineering.
2. To discuss the Various Models of Software.
3. Acquire skills and knowledge to advance their career, including continually upgrading professional, communication, analytic and technical skills.
4. To Learn the ability to work effectively as a team member and/or leader in an ever-changing professional environment.
5. Learn to develop a small Software.

Unit No.	Syllabus Content	Number of Hours
1	**Software Engineering:** What is software, Evolution of Software, Characteristics of software, Types of Software, Applications of software, Layered Technology. **Software Process Models:** Linear Sequential model, Prototype model, RAD model, Incremental model, Spiral Model, Component Based Development Model.	8
2	**Managing Software Project** **The Management Spectrum:** People, Product, Process, Project. Software Process and Project Metrics – Measures and Metrics, Software Measurement-Size Oriented Metrics, Function Oriented Metrics, Metrics for Quality-Overview, Measuring Quality, DRE. Software Requirement Specification-Problem Analysis, Requirement Specification. Validation and verification, The Make /Buy Decision.	7
3	**System Design:** Introduction, design principles, Problem partitioning, abstraction, top-down and bottom-up design, Low level Design: Modularization, Structure Chart, Flow chart, Functional versus Object oriented approach, design specification, Design verification, monitoring and control.	7
4	**Coding:** Top–down and bottom-up structured programming, information hiding, programming style, internal documentation, verification, monitoring and control. **Software testing:** Software Testing fundamentals, white box testing, Basis path testing, Cyclomatic Complexity, A strategic Issues, Unit testing, Integration testing, validation testing, System Testing.	7
5	**Software Project Management:** Cost estimation, project scheduling, Software configuration management, Quality assurance, Project Monitoring, Risk management.	7

COURSE OUTCOMES: The students would have learnt

CO 1: The fundamentals of Software Engineering.
CO 2: How to apply the Software Engineering Lifecycle.
CO 3: Understand of different Software architectural styles & process framework.
CO 4: Describe Software measurement & Software risks.
CO 5: To develop a Project.

Text Books:

1. Software Engineering by Bharat Bhushan Agrawal, Sumit Prakash Tayal,

Reference Books:

1. Software Engineering by Pressmen
2. Software Engineering by Pankaj Jalote
3. Software Project Management by Manish Kumar Jha.

Sub Title: MULTIMEDIA SYSTEM DESIGN		
Sub Code: CSUETK3	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- Understand technical aspect of Multimedia Systems.
- Discuss the standards available for different audio, video and text applications.
- Understand organization of multimedia database.
- Discuss various multimedia authoring systems.
- To develop multimedia application and analyse the performance of the same

UNIT No	Syllabus Content	No of Hours
1	**Introduction:** An introduction, Multimedia elements, Multimedia Applications, Multimedia System Architecture, Evolving Technologies for Multimedia Systems, Defining Objects for Multimedia systems, Multimedia Data Interface Standard, The need for data Compression, Multimedia databases.	8
2	**Compression Techniques:** Compression and Decompression, Types of compression, Binary Image Compression schemes, Color, Gray Scale, Still-video image Compression, Video Image Compression, Audio Compression, Fractal Compression.	7
3	**Formats**: Data and Format Standards, Rich-text Format, TIFF File Format, Resource Interchange File Format (RIFF), MIDI File Format, JPEG DIB File Format for still and Motion Images, MPEG standards Pen Input, Video and Image Display systems, Print Output Technologies, Image Scanners, Digital Voice and Audio, Digital Camera, Video Images and Animation, Full-Motion Video.	7
4	**Storage:** Storage and Retrieval Technologies, Magnetic Media Technology, Optical Media, Hierarchical Storage Management, Cache management for storage systems, Multimedia Application Design, Multimedia application classes, Types of multimedia systems, Components of multimedia systems, Organizing multimedia databases.	7

5	**Multimedia Design:** Unified Communication, video conferencing and Chat, Multimedia Authoring and User Interface, Multimedia authoring system, Hypermedia application design consideration, User interface design, Object display/playback issues, Multimedia Operating Systems introduction, real time, Resource management, process management, file systems.	**7**

COURSE OUTCOMES: The students would have learnt

CO1.	Various technical aspect of Multimedia systems.
CO2.	Various file formats for audio, video & text media.
CO3.	Develop various Multimedia systems applicable in real time.
CO4.	Concept of storage management of Multimedia system.
CO5.	To evaluate multimedia application for its optimum performance.

Text Books:

1. Multimedia System Design by Prabhat K. Andleigh & Kiran Thakrar, Prentice PTR, NJ.
2. Multimedia: computing communications and applications by Ralf Steinmetz and Klara Nahrstedt, Innovating technology series by Pearson Edu. Asia.

Reference Books:

1. Multimedia Communications, Directions & Innovations by Jerry D. Gibson, HarcourtIndia Pvt. Ltd.
2. Multimedia computing by Borko, Handbook of CRC Press.
3. Multimedia Applications Development by Mark J. Bunzel Sandra K. Morris, McGraw Hill.
4. Fundamentals of Multimedia by Ze-Nian Li, Mark S. Drew, by Pearson Edu. Asia

Sub Title: SOFTWARE TESTING AND QUALITY ASSURANCE		
Sub Code: CSUETK4	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- To discuss the fundamental concepts of Software Quality
- Finding defects which may get created by the programmer while developing the software.
- To make sure that the end result meets the business and user requirements.
- To gain the confidence of the customers by providing them a quality product.
- Gaining confidence in and providing information about the level of quality.

UNIT No	Syllabus Content	No of Hours
1	**Software Quality:** Ethical Basis for software Quality, Total quality Management Principles, Software Processes and Methodologies, Quality Standards, Practices & conventions	8
2	**Software Management:** Reviews and Audits. Enterprise Resource Planning Software, Measurement Theory, Software Quality Metrics, designing Software Measurement Programs, Organizational Learning.	7
3	**Improving Quality with Methodologies:** Structured information Engineering Object-Oriented Software, Reverse Engineering, Measuring Customer Satisfaction Defect Prevention, Reliability Models, Reliability Growth Models.	7
4	**Software Quality Engineering:** Defining Quality Requirements Management, Complexity Metrics and Models, Management issues for software Quality, Project Tracking and Oversight, Use of CASE tool Technology, Role of Groupware, data Quality Control.	7
5	**Project Configuration Management:** Configuration Management Concepts, Configuration Management Process, Document Control, Configuration Management plan of the WAR Project. **Software Testing:** Unit, Integration & System testing, Benchmarking and Certification.	7

COURSE OUTCOMES: The students would have learnt

CO1.	Understanding basic concepts of software testing and quality assurance.
CO2.	Define the scope of software testing and quality assurance projects.
CO3.	Efficiently perform testing and quality assurance activities using modern software tools.
CO4.	Estimate cost of a testing and quality assurance project and manage budgets.
CO5.	Prepare test plans and schedules for a testing and quality assurance project.

Text Books:

1. Mark Paulik, The capability Maturity Model-guidelines for Improving the software Process, Addison Wesley
2. Wilson, Rodney C, Software RX secrets of Engineering Quality Software, Prentice Hall.

Reference Books:

1. Stephan Kan, Metrics and Models in Software quality, Addison Wesley.
2. Ginac, Frank P, Customer Oriented Software Quality Insurance, Prentice Hall

Sub Title: DISTRIBUTED SYSTEM		
Sub Code: CSUETK5	**No. of Credits : 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration : 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVE:

1. To know distributed file systems
2. To know security and protection of distributed file system
3. To know distributed services.
4. To knowledge of Synchronization and Deadlock.
5. To know about optimization technique.

UNIT No	Syllabus Content	No of Hours
1	**Fundamentals of Distributed Computing:** Evolution of Distributed Computing Systems, System models, issues in design of Distributed Systems, Distributed computing environment, web based distributed model, computer networks related to distributed systems and web based protocols.	8
2	**Message Passing for Communication:** Inter process Communication, Desirable Features of Good Message-Passing Systems, Issues in IPC by Message, Synchronization, Buffering, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication.	7
3	**Remote Procedure Calls:** The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshalling Arguments and Results, Server Management, Communication Protocols for RPCs, Complicated RPCs, Client-Server Binding, Exception Handling, Security, Some Special Types of RPCs, Lightweight RPC, Optimization for Better Performance.	7
4	**Distributed Shared Memory:** Design and Implementation issues of DSM, Granularity, Structure of Shared memory Space, Consistency Models, replacement Strategy, Thrashing, Other Approaches to DSM, Advantages of DSM.	7

5	**Synchronization and Distributed File Systems:** Clock Synchronization, Event Ordering, Mutual Exclusion, Election, Algorithms. Desirable Features of a good Distributed File Systems, File Models, File Accessing Models, File-sharing Semantics, File caching Schemes, File Replication, Fault Tolerance, Design Principles, Sun's network file system, Andrews file system, comparison of NFS and AFS.	**7**

COURSE OUTCOMES: The students would have learnt

CO1: Know to hardware and software issues in modern distributed systems.
CO2: Get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems.
CO3: Analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed.
CO4: Know about Shared Memory Techniques.
CO5: Have sufficient knowledge about file access.

Text Books:

1. Distributed Systems Principles and Paradigms, Tanenbaum S. Maarten V.S (Pearson Education)
2. Distributed Systems concepts and design, George Coulouris, Jean Dollimore. Tim Kindberg:

Reference Books:

1. Distributed Computing: Fundamentals, Simulations and Advanced Topics by Hagit Attiya and Jennifer Welch Distributed Algorithms by Nancy Ly

Sub Title: INFORMATION RETRIEVAL SYSTEMS		
Sub Code: CSUETK6	**No. of Credits : 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration : 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVE:

1. Demonstrate genesis and diversity of information retrieval situations for text and hyper media.
2. Describe hands-on experience store, and retrieve information from www using semantic approaches.
3. Demonstrate the usage of different data/file structures in building computational search engines.
4. Analyze the performance of information retrieval using advanced techniques such as classification, clustering, and filtering over multimedia.
5. Analyze ranked retrieval of a very large number of documents with hyperlinks between them.

UNIT No	Syllabus Content	No of Hours
1	**Retrieval Strategies:** vector space model, Probabilistic retrieval strategies: Simple term weights, Non binary independence model, Language models.	8
2	**Retrieval Utilities:** Relevance feedback, clustering, N-grams, Regression analysis, Thesauri	7
3	**Retrieval Utilities:** Semantic networks, parsing Cross –Language: Information Retrieval: Introduction, Crossing the Language barrier.	7
4	**Efficiency:** Inverted Index, Query processing, Signature files, Duplicate document detection.	7
5	Integrating structured data and text. A historical progression, Information retrieval as relational application, Semi Structured search using a relational schema. Distributed Information Retrieval: A theoretical Model of Distributed retrieval, web search	7

COURSE OUTCOMES: The students would have learnt

CO1: Describe the objectives of information retrieval systems.
CO2: Describe models like vector-space, probabilistic and language models to identify the similarity of query and document
CO3: Implement clustering algorithms like hierarchical agglomerative clustering and k-means algorithm.
CO4: Understand relevance feedback in vector space model and probabilistic model.
CO5: Understand query, document and phrase translation.

Text Books:

1. Information Retrieval – Algorithms and Heuristics, David A. Grossman, Ophir Frieder, Springer, 2nd Edition (Distributed by Universal Press), 2004

Reference Books:

1. Information Storage and Retrieval Systems: Theory and Implementation, Gerald J Kowalski,Mark T Maybury Springer, 2004.
2. Mining the Web: Discovering Knowledge from Hypertext Data, Soumen Chakrabarti, Morgan – Kaufmann Publishers, 2002.
3. An Introduction to Information Retrieval, By Christopher D Manning, Prabhakar Raghavan, Hinrich Schutze, Cambridge University Press, England, 2009.

Sub Title: RELATIONAL DATA BASE MANAGEMENT SYSTEM LAB	
Sub Code: CSUELT1	**No. of Credits: 1.5=0: 0: 1.5(L-T-P)**
Exam Duration: 3 hours	**IA+ESE =25+25**

LAB OBJECTIVES:

1. To understand the Basic SQL Commands.
2. To study the Nested Queries.
3. To understand PL/SQL.
4. To understand JOINS in SQL.
5. To study the ROLL Back etc.

Unit No.	Syllabus Content	Number of Hours
1	a) Write the queries for Data Manipulation and Data Definition Language. b) Write SQL queries using logical operations and operators. c) Write SQL query using group by function.	18
2	a) Write SQL queries for group functions. b) Write SQL queries for sub queries, nested queries.	
3	a) Write a program by the use of PL/SQL b) Write SQL queries to create views	
4	a) Write an SQL query to implement JOINS. b) Write a query for extracting data from more than one table.	
5	Write a query to understand the concepts for ROLL BACK, COMMIT & CHECK POINTS.	

LAB OUTCOMES: The students would have learnt

CO 1: Describe the DDL and DML commands.
CO 2: Understand the Group and Nested Queries.
CO 3: Evaluate the PL/SQL and Views.
CO 4: Identify the Join Operation.
CO 5: Identify the Rollback, Commit and Check Points in SQL.

Text Books:

1. An Introduction to Database System, Date C J, Addision Wesley.
2. Database Concepts, Korth, Silbertz, Sudarshan, McGraw Hill.
3. Fundamentals of Database Systems, Elmasri, Navathe, Addision Wesley.
4. Database Management System, Leon & Leon, Vikas Publishing House.

Reference Books:

1. An introduction to Database Systems, Bipin C. Desai, Galgotia Publication.
2. Database Management System, Majumdar & Bhattacharya, TMH.
3. Database Management System, Ramakrishnan, Gehrke, McGraw Hill.
4. Database Processing: Fundamentals, Design and Implementation, Kroenke, Pearson Education.
5. DBMS: Complete Practical Approach, Maheshwari Jain, Firewall Media, New Delhi.

Sub Title: PARALLEL COMPUTING LAB	
Sub Code: CSUELT2	**No. of Credits: 1.5=0: 0: 1.5(L-T-P)**
Exam Duration: 3 hours	**IA+ESE =25+25**

LAB OBJECTIVES:

1. To study about various platform and libraries of parallel processing.
2. To study about to create MPI programs to accomplish a computational task
3. To study about of API to carried out MPI
4. To study about to know GPU importance in parallel programming
5. To study about of shared memory in parallel

Unit No.	Syllabus Content	Number of Hours
I, II, III, IV and V	• Understanding the environment of OMP, MPI, CUDA • Parallel programming environment and platform. • Create and simulate multiple processes and threads on MP system. • Simulate parallel program to synchronization and pooling of processes. • Simulate the loop and function in parallelism manner. • Simulate a parallel algorithm to perform some mathematical calculation and their execution time. • Simulate the parallel sorting algorithm and their execution time. • Simulate the parallel searching algorithm and their execution time. • Simulate parallel some operation on array and list with their execution time. • Optimization technique using shared memory module on MP system. • Heterogeneous calculation using PYTHON (PTK), CUDA, and OPENCL tool kit.	18

LAB OUTCOMES: The students would have learnt

CO 1: Simulate and create process and threads.
CO 2: Simulate parallel algorithm using various MPI.
CO 3: Simulate parallel program for many computational task.
CO 4: Simulate various memories to carry out optimization.
CO 5: Do synchronous and asynchronous of process and pooling.

Text Books:

1. Programming Massively Parallel Processors: A Hands-on Approach Paperback – 20 December2012 by David B. Kirk , Wen-mei W. Hwu
2. Introduction to Parallel Algorithms 1st Edition by Joseph JaJa.

Reference Books:

1. Python Parallel Programming Cookbook Paperback – August 26, 2015 by Giancarlo Zaccone.
2. High Performance Scientific Computing" by Victor Eijkhout, Edmond Chow, and Robert van de Geijn.

Sub Title: DESIGN AND ANALYSIS OF ALGORITHMS		
Sub Code: CSUFTT1	**No. of Credits: 3=3:0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. To Analysis efficiency of algorithms on the basis of their time complexity and space complexity by mathematically foundation (asymptotic notation)
2. To study about design and analysis of divide and conquer and greedy algorithm on the basis of their attributes and also describe when could be used these technique and which situation for which problem
3. To know dynamic programming(DP) paradigm and algorithm for problems on the different data structure like graph and array
4. Know a branch and bound technique and backtracking technique for problems
5. Know the classes of problems like P,NP on their basis of nature (running time complexity)

Unit No.	Syllabus Content	Number of Hours
1	**Algorithms Analysis:** Space and Time Complexity, Asymptotic Notations, mathematical foundations: growth functions, complexity analysis of algorithms, Recursive algorithms, analysis of no-recursive and recursive algorithms, Recurrences equation and their solution. Master method, recursive tree and backward substitution method.	8
2	**Divide & Conquer and Greedy Method:** Divide and conquer-Finding Maxima and Minima Binary search, Merge Sort, Quick Sort, and selection sort. Stassen's Matrix multiplication Greedy method-introduction, Knapsack problem, travelling sales person problem, Minimum Spanning trees- kruskal's algorithm, prim's algorithm, Single source shortest path-Dijkstra's algorithm, Huffman codes.	7
3	**Dynamic Programming and Search Techniques:** Dynamic Programming: Introduction, Matrix chain multiplication, Single source shortest path- Bellman-Ford, all pairs shortest path, optimal binary search tree, o/1 knapsack problem, travelling sales person problem, longest common subsequence Search techniques: Techniques for binary trees, techniques for graphs –DES and BFS, connected components, Bi-connected components, and Strongly-connected components, Topological sorting. **Heap Data Structure:** Min and Max Heap, Fibonacci Heap, Binomial heap, Amortized Analysis, Heap sort.	7
4	**Back Tracking and Branch and Bound:** Backtracking: Back tracking and Recursive back tracking, applications of back tracking paradigm, the 8-queen problem, graph coloring, Hamiltonian cycles. **Branch and Bound:** introduction, 0/1 knapsack problem, travelling sales person problem, Least Cost (LC) search – the 15-puzzle problem.	7

5	**Complexity Class Theory and Pattern Matching :** Problem classes, Optimization problem, decision making problem, P VS NP VS NPC VS NPH, Venn diagram and their analysis, deterministic and non-deterministic polynomial time algorithm, Cook Levin theorem, Verification algorithms for some NP Class: subset sum problem, clique problem, vertex cover,independent set problem, Circuit Satisfiability problem, 2-SAT, 3-SAT etc. **Pattern matching:** Basic concept of pattern reorganization and their algorithms.	**7**

COURSE OUTCOMES: The students would have learnt

CO 1: Technique to calculate and obtain the running time complexity and space complexity of any kind of algorithm.

CO 2: Design divide and conquer and greedy algorithm for problems and at the same time they will able to know that which data structure are adequate to enhance the running time complexity.

CO3: Spontaneously able to described and analyze the dynamic-programming (DP) algorithm moreover when an algorithmic design situation calls for it and can construct a new DP algorithm for given a particular problem.

CO 4: Spontaneously able to construct and design branch & bound and backtracking algorithm fora particular problem on the basis of the problem nature analysis and requirement.

CO 5: Analyzed and write verification algorithm for some NP and NPH class problems.

Text Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald Rivest, Clifford Stein, "Introduction to Algorithm" ,Publisher PHI. ISBN 81-203-2141-3
2. Sanjoy Dasgupta, Christos H. Papadimitriou and Umesh V. Vazirani, Algorithms, Tata McGraw-Hill, 2008
3. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005.
4. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Interne Examples, Second Edition, Wiley, 2006.

Reference Books:

1. Udi Manber, Algorithms – A Creative Approach, Addison-Wesley, Reading, MA, 1989.
2. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997

Sub Title: JAVA		
Sub Code: CSUFTT2	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. To discuss the fundamental concepts of OOPs and Java.
2. Knowledge about Class and Object.
3. Knowledge of Inheritance, Interface an Array.
4. Java programming using multithreading.
5. Learn to develop a Programs using Java .

Unit No.	Syllabus Content	Number of Hours
1	**Java Fundamentals:** Basic Concepts of Object-Oriented Programming, Java History, How Java Differs from C and C++, Web Browsers, Java Environment, Java Program Structure, Java Tokens, Installing and Configuring Java, Implementing a Java Program, Java Virtual Machine.	**8**
2	Constants, Variables and Data Types, Declaration of Variables, Giving values to variables, Scope of Variables, Symbolic Constants, Type Casting, Getting Values of Variables, Standard Default Values, **Java Operators,** Mathematical Functions, Control Statements (if statement, switch statement and Conditional operator statement), Decision Making and Looping (while construct, do construct, for construct), Jumps in Loops. **Class, Objects and Methods:** Introduction of Class, defining a Class, Fields Declaration, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods.	**7**
3	**Inheritance:** Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Abstract Methods and Classes. **Introduction of Array:** One Dimensional Array, Creating an array, Two-Dimensional arrays, Strings. **Interfaces:** Defining Interfaces, Extending Interfaces, Implementing Interfaces.	**7**

4	**Packages:** Java API Packages, Using System Packages, Naming Conventions, Creating Packages, Accessing a Package, Using a Package, Adding a Class to a Package, Hiding Classes **Introduction to Multithreaded Programming:** Difference between Multithreading and Multitasking, Creating threads, Extending the thread class, Life Cycle of a thread, Using thread Methods, Thread Exception, Synchronization, Implementing the Runnable Interface, Inter-thread Communication. **Managing Errors and Exceptions**: Types of Errors, Exceptions.	**7**
5	**Introduction of Applet Programming,** How Applets Differ from Applications, Preparing to Write Applets, Building Applet Code, Applet Life Cycle, Creating an Executable Applet, Applet Tag, Adding Applet to HTML file, Running the Applet, Passing Parameters to Applets, **Event handling,** Introduction of Graphics Programming, Introduction to AWT package, **Managing Input/Output Files in Java:** Concept of Streams, Stream Classes.	**7**

COURSE OUTCOMES: The students would have learn

CO 1: The fundamentals of OOP and Java.
CO 2: The concept of Class ,Objects and Operators.
CO 3: Implement interfaces,intehitance and Array.
CO 4: Use of Multithreading and How to handle the Exceptions.
CO 5: Develop programs of Applet ,Event handling and managing files in java.

Text Books:

1. E. Balagurusamy, Programming with Java A Primer, Fourth Edition, McGrawHill, 2010.

Reference Books:

1. H. Schildt, Java TM 2: The Complete Reference, Fourth Edition, Tata McGraw-Hill, 2001.
2. K. A. Mughal and R. W. Rasmussen, A Programmer's Guide to Java TM SCJP.
3. Certification A Comprehensive Primer, Third Edition, Addison Wesley, 2008.

Sub Title: ARTIFICIAL INTELLIGENCE		
Sub Code: CSUFTT3	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. To understand the Basics of Artificial Intelligence
2. To study the Knowledge Representation Techniques
3. To understand Learning
4. To understand NLP
5. To study Expert System and AI Programming Languages

Unit No.	Syllabus Content	Number of Hours
1	**Overview of Search Techniques:** Introduction to AI, Problem Solving, State space search, Blind search: Depth first search, Breadth first search, Informed search: Heuristic function, Hill climbing search, Best first search, A* & AO* Search, Constraint satisfaction. Game tree, Evaluation function, Mini-Max search, Alpha-beta pruning, Games of chance.	10
2	**Knowledge Representation (KR):** Introduction to KR, Knowledge agent, Predicate logic, WFF, Inference rule & theorem proving, forward chaining, backward chaining, resolution; Propositional knowledge, Rule Based Systems, Forward reasoning: Conflict resolution, backward reasoning: Use of Back tracking, Structured KR: Semantic Net - slots, inheritance, Frames- exceptions and defaults attached predicates, Conceptual Dependency formalism and other knowledge representations.	10
3	**Handling uncertainty & Learning:** Source of uncertainty, Probabilistic inference, Bayes' theorem, Limitation of naïve Bayesian system, Bayesian Belief Network (BBN), Inference with BBN, Dempster-Shafer Theory, Fuzzy Logic, Fuzzy function, Fuzzy measure, Non monotonic reasoning: Dependency directed backtracking, Truth maintenance systems. Learning: Concept of learning, Learning model, learning decision tree, Paradigms of machine learning, Supervised & Unsupervised learning, Example of learning, Learning by induction, Learning using Neural Networks.	10
4	**Natural Language Processing (NLP) & Planning:** Overview of NLP tasks, Parsing, Machine translation, Components of Planning System, Planning agent, State-Goal & Action Representation, Forward planning, backward chaining, Planning example: partial-order planner, Block world.	10
5	**Expert System & AI languages:** Need & Justification for expert systems- cognitive problems, Expert System Architectures, Rule based systems, Non production system, knowledge acquisition, Case studies of expert system. AI language: Prolog syntax, Programming with prolog, backtracking in prolog, Lisp syntax, Lisp programming.	10

COURSE OUTCOMES: The students would have learnt

CO 1: Describe the basics of Artificial Intelligence and Overview of Search Techniques.
CO 2: Understand the Knowledge Representation Techniques.
CO 3: Evaluate the Handling Uncertainty and Learning.
CO 4: Identify the NLP and Planning.
CO 5: Identify the Expert System and AI Programming Languages.

Text Books:

1. E. Rich and K. Knight, Artificial Intelligence, Forty Sixth Edition, Tata McGrawHill,2007.
2. D.W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Tenth Edition, Prentice Hall of India, 2001.

Reference Books:

1. S. Kaushik, Logic and Prolog Programming, New Age International Limited, 2006.

Sub Title: DIGITAL IMAGE PROCESSING		
Sub Code: CSUFTK1	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. To discuss the fundamental concepts of digital image processing.
2. To discuss the various image, transform with respect to basic functions, properties and application.
3. To discuss image enhancement technique in spatial and frequency domain.
4. To discuss image segmentation and restoration technique in spatial and frequency domain.
5. To discuss the simple image processing techniques.

Unit No.	Syllabus Content	Number of Hours
1	**Digital Image Fundamentals:** Background, digital image representation, examples of field that use DIP, fundamental steps in digital image processing, Simple image model, basic relationships between pixels: neighborhood of a pixel, Connectivity, Basic transformations: translational, rotational, scaling. Color models and transformations, Pseudo color Image Processing.	8
2	**Image Transforms:** Introduction to 2D Transforms: Fourier Transform and Properties, DCT and Properties, Hadamard Transform and Properties and properties **Image Compression:** Fundamentals, image compression models, elements of Information theory, Image Compression: lossy and non-lossy compression, image compression standards.	7
3	**Image Enhancement Spatial Domain:** Background, Basic gray level transformations, histogram: Computation histogram , histogram specification, histogram equalization, enhancement using arithmetic/logic operations, basics of spatial filtering, smoothing sharpening spatial filters, combining spatial enhancement methods. **Edge Detection Methods:** Prewitt, Sobel and Robert **Frequency Domain:** Background, introduction to the frequency domain, smoothing and sharpening frequency domain filters, homomorphic filtering, generation of spatial masks from frequency domain specifications.	7
4	**Image Segmentation:** Detection of discontinuities, edge linking & boundary detection, thresholding, Region based segmentation, morphological water sheds, the use of motion in segmentation	7

5	**Image Restoration:** Degradation model, Noise models, restoration in the presence of noise only (Spatial and frequency domain filters), Inverse filtering, LMS filtering, Wiener filter, constrained least square restoration, interactive restoration, restoration in the spatial domain	**7**

COURSE OUTCOMES: The students would have learnt

CO 1: Understanding of basic image processing techniques.
CO 2: Image analysis using 2-D image transforms.
CO 3: Image enhancement technique in spatial and frequency domain.
CO 4: Image processing application such as compression, segmentation and restoration.
CO 5: Learn to apply different image processing technique.

Text Books:

1. Digital Image Processing, R C Gonzalez & R E Woods, PearsonEducation,3 edition.
2. Digital Image Processing and Computer Vision, Milan Sonka, Cengage learning, First edition.

Reference Books:

1. Digital Image Processing, S. Jayaraman, S. Esakkirajan, T. Veera Kumar, Tata McGraw Hill, 2009.
2. Fundamentals of Digital Image processing, A K Jain, PHI/PearsonEducation,1989.
3. Digital Image Processing, Sid Ahmed, McGraw Hill.

Sub Title: COMPUTER GRAPHICS		
Sub Code: CSUFTK2	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week:03**
Exam Duration: 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. The main objective of the course is to introduce students with fundamental concepts and theory of computer graphics.
2. Understand the need of developing graphics application.
3. Learn algorithmic development of graphics primitives like: line, circle, polygon etc.
4. Learn the representation and transformation of graphical images and pictures.
5. It presents the important drawing algorithm, polygon fitting, clipping and 2D transformation, curves and an introduction to 3D transformation.

Unit No.	Syllabus Content	Number of Hours
1	Overview of Graphics System, Working of Input and output Devices, Characteristic's of Character Generation, Cathode Ray Tube, Color lookup table. VGA, Clipping Algorithms: Scan line polygon Fill algorithm, Inside-outside test, Non-zero winding number rule, Flood fill algorithm, DDA Line drawing Algorithm, Bresenhams Line drawing Algorithm,	**8**
2	**CURVES & SURFACES :** Conics-Parametric forms for circle, ellipse, Parabola, Raster scan & Random scan system, Mid-Point & Bresenhams circle, drawing Algorithm, Midpoint ellipse generating algorithm, Basic Transformation: 2-D Transformation, translation, rotation and scaling,	**7**
3	Windowing and clipping Viewing transforming, Clipping, Generalize clipping multiple windowing, Sutherland Cohen Line Clipping Algorithms, Different Line Clipping algorithm, **Polygon clipping:** Hodgeman- Sutherland & Weiler-Atherton polygon clipping, 3-D Transformation, translation, rotation and scaling, Filled Area Primitives, Illumination model for diffused & specular reflection, Basics of Segmentation: Segment table, posting & unposting,	**7**
4	Projections & Hidden Surface Removal, Parallel projection on x-y plane (including oblique view), Perspective projection-1, 2 and 3 Vanishing points, Reconstruction of 3-D images. **Hidden Surface Removal:** Back face removal, Floating Horizon method for curved objects, Z-Buffer or Depth Buffer Algorithm, Scan-line algorithm, Warnock's algorithm.	**7**

5	Generation though Bernstein polynomials, Condition for smooth joining of 2 segments, Bezier Curves, Need for cubic parametric curves, Cubic parametric curves c0, Cubic parametric curves, c1, c2 continuity, Convex Hull property, B-Spline Curves: Knot vectors-uniform and open uniform curves ,Uniform, Periodic B-splines, Open B-splines, Uniform B-splines, Non-uniform B-splines, Rational B-splines, Beta splines.	**7**

COURSE OUTCOMES: The students would have learnt

CO 1: After the completion of this course, students will be able to Analyze the basic operations of the computer graphics.
CO 2: Understand the working principle and characteristics of line, circle, ellipse generation algorithm etc.
CO 3: Understand the working principle and characteristics of 2D and 3D transformation process.
CO 4: Describe the working principle and characteristics of Segmentation process.
CO 5: Describe the working principle and characteristics of Bizier curve and B-Spline Curve.

Text / Reference Books:

1. Hearn Baker, "Computer Graphics", McGraw= Hill.
2. Rogers, "Procedual Elements of Computer graphics", McGraw-Hill.
3. Newman & Sproulle, "Principlesof Interactive Computer Graphics", MGH 1987.
4. Harringtons S. , "Computer Graphics", A programming approach Second Edition MGH 1987.
5. Rogers & Adams, " Mathematical Elements of Computer Graphics", Second Edition MGH.
6. Henary Baper, "Computer Graphics".

Sub Title: MOBILE COMMUNICATION		
Sub Code: CSUFTK3	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVES:

1. Discuss the evolution of Mobile communication and cell concept to improve capacity of the system.
2. Discuss the radio transmission of Mobile communication.
3. Discuss the concept of GSM, DECT and TETRA.
4. To know about infrastructure and infrastructure less network.
5. Discuss the concept of mobility i.e. Mobile IP and TCP.

Unit No.	Syllabus Content	Number of Hours
1	**Introduction:** Applications: Vehicles, Emergencies, Business, Replacement of wired networks, Infotainment, Location dependent services. Mobile and wireless devices, history of wireless communication, Reference Model.	8
2	**Wireless Transmission:** Frequencies for Radio Transmission, Signal Propagation, Multiplexing, Modulation, Spread Spectrum, Cellular System Medium Access Control Hidden And Exposed Terminals, Near and Far Terminals, SDMA, FDMA, TDMS, CDMA, Comparison Among Multiple Access Protocols.	7
3	**Telecommunications Systems:** GSM: Mobile Services, System Architecture, Radio Interface, Protocols, Localization and Calling, Handover,Security, New Data Services. Dect, Tetra	7
4	**Wireless Lan:** Infrared vs radio transmission, Infrastructure and ad-hoc network, **IEEE 802.11:** System architecture, protocol architecture, Physical layer, medium access control layer, MAC management, 802.11b, 802.11a, Newer developments, HIPERLAN, Bluetooth.	7
5	**Mobile Communication Layers:** Mobile network layer: Mobile IP, Goals, assumptions and requirements, Entities and terminology, IP packet delivery, Agent discovery, Registration, Tunneling and encapsulation, Optimizations, Reverse tunneling, IPv6. DHCP, Mobile Ad-hoc Routing, Mobile TCP, File System	7

COURSE OUTCOMES: The students would have learnt

CO1: Understand the evolution of Wireless communication.
CO2: Understand the concept of cellular system.
CO3: Understand the working of GSM.
CO4: Understand the infrastructure less network like Bluetooth.
CO5. Understand the concept of Mobility in mobile communication.

Text Books:

1. Mobile Communications by J. Schiller, Addison Wesley
2. Mobile IP by Charles Perkins, Addison Wesley.

Reference Books:

1. Ad hoc Networks by Charles Perkins, Addison Wesley.
2. Understanding WAP by M. V. D. Heijden, M. Taylor, Artech House.

Sub Title: ROBOTICS		
Sub Code: CSUFTK4	**No. of Credits: 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration: 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVE:

- Learn the basic concepts of Robots.
- Learn the concepts of Kinematics of Robotics.
- Learn the concepts of Motions, velocities and dynamic analysis of force.
- Learn the concepts of Motion and Trajectory planning.
- Learn the concepts of Potential Functions, Visibility Graphs and Coverage Planning.

UNIT No	Syllabus Content	No of Hours
1	Introduction to Robotics Evolution of robots and robotics, progressive advancement in robots, definitions and classifications, laws of robotics, robot anatomy and related attributes, human arm characteristics, robot control system, manipulation and control, sensors in robotics, robots programming, the future prospects. .	**8**
2	10 Coordinate Frames, Mapping and Transforms Robot specification and notations, Coordinate frames, description of objects in space, transformation of vectors, inverting a homogeneous transform, fundamental rotation matrices, yaw pitch and roll, yaw pitch and roll transformation, equivalent angle.	**7**
3	Symbolic Modelling of Robots – Direct Kinematic Model Mechanical structure and notations, description of links and joints, kinematic modelling of the manipulator, Denavit – Hartenberg notation, kinematic relationship between adjacent links, manipulator, transformation matrix, introduction to inverse kinematic model, Artificial Intelligence in robotics.	**7**
4	Robotic Sensors and Vision The meaning of sensing, sensors in robotics, kinds of sensors used in robotics, robotic vision, industrial applications of vision-controlled robotic systems, process of imaging, architecture of robotic vision systems, image acquisition, description of other components of vision system, image representation, image processing.	**7**

5	Robot Applications Industrial applications, material handling, processing applications, assembly applications, inspection, application, principles for robot application and application planning, justification of robots, robot safety, non-industrial applications, robotic application for sustainable development & social issues.	**7**

COURSE OUTCOMES: The students would have learnt

CO1. Apply the basic concepts of Robots.
CO2. Apply and evaluate the concepts of Kinematics of Robotics.
CO3. Apply the Motions, velocities and dynamics analysis of force.
CO4. Apply and evaluate Motion and trajectory planning.
CO5. Apply the concepts of potential functions, visibility graphs and coverage planning.

Text Books:

1. Robotics & Control – R.K. Mittal & I.J. Nagrath – TMH Publications
2. Robotics for engineers –Yoram Korean- McGrew Hill Co.
3. Industrial Robotics Technology programming and Applications –M. P. Groover, M. Weiss.
4. Robotics Control Sensing, Vision and Intelligence –K. S. Fu, R. C. Gonzales, C. S. G. Lee-McGrew Hill Book co.

Reference Books:

1. Kinematics and Synthesis of linkages –Hardenberg and Denavit– McGrew Hill Book Co
2. Kinematics and Linkage Design – A.S. Hall – Prentice Hall
3. Kinematics and Dynamics of Machinery–J. Hirschhorn– McGrew Hill Book Company

Sub Title: VISUAL BASIC.NET		
Sub Code: CSUFTK5	**No. of Credits : 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration : 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVE:

1. Describe the basic structure of a Visual Basic.NET project and use main features of the integrated development environment (IDE).
2. Learn about the different control available in Visual Basic.Net.
3. Design/develop programs with GUI interfaces.
4. Learn about the concept of Object oriented programming.
5. Learn to create application using ADO.Net.

UNIT No	Syllabus Content	No of Hours
1	Introduction to .NET, .NET Framework features & architecture, CLR, Common Type System, MSIL, Assemblies and class libraries. Introduction to visual studio, Project basics, types of project in .Net, IDE of VB.NET- Menu bar, Toolbar, Solution Explorer, Toolbox, Properties Window, Form Designer, Output Window, Object Browser. .	8
2	**The VB.NET Language:** Variables -Declaring variables, Data Type of variables, Forcing variables declarations, Scope & lifetime of a variable, Constants, Arrays, types of array, control array, Collections, Subroutines, Functions. Control flow statements: conditional statement, loop statement. Msgbox & Inputbox.	7
3	**Working with Forms:** Loading, showing and hiding forms, controlling One form within another. **GUI Programming with Windows Form:** Textbox, Label, Button, Listbox, Combobox, Checkbox, PictureBox, RadioButton, Panel, scroll bar, Timer.There Properties, Methods and events. OpenFileDilog, SaveFileDialog, FontDialog, ColorDialog Link Label. **Designing Menues :** Context Menu, access & shorcut keys.	7
4	**Object Oriented Programming:** Classes & objects, fields Properties, Methods & Events, constructor, inheritance. Access Specifiers: Public Private, Projected. Overloading, My Base & My class keywords.	7

5	**Database programming with ADO.NET:** Overview of ADO, from ADO to ADO.NET, Accessing Data using Server Explorer. Creating Connection, Command, Data Adapter and Data Set with OLEDB and SQLDB. Display Data on data bound controls, display data on data grid. Generate Reports Using Crystal Report Viewer.	**7**

COURSE OUTCOMES: The students would have learnt

CO1: .NET Framework and describe some of the major enhancements to the new version of Visual Basic.
CO2: Perform tests, resolve defects and revise existing code.
CO3: Learn to apply Object oriented concept in programming.
CO4: Learn to create applications using Microsoft Windows Forms.
CO5: Learn to create applications using ADO. NET.

Text Books:

1. VB.NET Programming Black Book by stevenholzner –dreamtech publications
2. Mastering VB.NET by Evan gel ospetroutsos- BPB publications

Reference Books:

1. Introduction to .NET framework-Worx publication
2. msdn.microsoft.com/net/

Sub Title: BIG DATA ANALYSIS		
Sub Code: CSUFTK6	**No. of Credits : 3=3: 0: 0(L-T-P)**	**No of lecture hours/week :03**
Exam Duration : 3 hours	**IA+ESE=40+60**	**Total no of contact hours:36**

COURSE OBJECTIVE:

1. To formulate the difference between Big data and Data Analytics.
2. To provide the students with the conceptual knowledge of Big Data.
3. To get familiarized with the analytical methods.
4. To explore validation and testing methods for decision making.
5. To gain knowledge on the tools such as MapReduce and hadoop

UNIT No	Syllabus Content	No of Hours
1	**Introduction to Big Data:** Introduction to big data : Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting	8
2	**Mining data streams:** Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis- Stock Market Predictions.	7
3	**Hadoop:** History of Hadoop- the Hadoop Distributed File System – Components of Hadoop Analysing the Data with Hadoop- Scaling Out- Hadoop Streaming- Design of HDFS-Java interfaces to HDFS Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Map Reduce Types and Formats- Map Reduce FeaturesHadoop environment.	7
4	**Framework:** Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphere BigInsights and Streams.	7
5	**Predictive Analysis:** Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.	7

COURSE OUTCOMES: The students would have learnt

CO1: Identify Big Data and its Business Implications.
CO2: List the components of Hadoop and Hadoop Eco-System
CO3: Access and Process Data on Distributed File System
CO4: Manage Job Execution in Hadoop Environment
CO5: Develop Big Data Solutions using Hadoop Eco System

Text Books:

1. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.
2. Hadoop: The Definitive Guide, Tom White, Third Edition, O'reilly Media, 2012.
3. Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos,, McGrawHill Publishing, 2012.
4. Mining of Massive Datasets, Anand Rajaraman and Jeffrey David Ullman, CUP, 2012.
5. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics Bill Franks, John Wiley& sons, 2012.
6. Making Sense of Data, Glenn J. Myatt, John Wiley & Sons, 2007.
7. Big Data Glossary, Pete Warden, O'Reilly, 2011.

Reference Books:

1. Data Mining Concepts and Techniques, Jiawei Han, Micheline Kamber, 2nd Edition, Elsevier, Reprinted 2008.
2. Intelligent Data Mining, Da Ruan, Guoquing Chen, Etienne E.Kerre, Geert Wets, Springer, 2007.
3. Harness the Power of Big Data The IBM Big Data Platform Paul Zikopoulos, Dirkde Roos, Krishnan Parasuraman, Thomas Deutsch, James, Giles , David Corrigan, Tata McGraw Hill Publications, 2012.
4. Big Data Science & Analytics: A HandsOn Approach, Arshdeep Bahga, Vijay Madisetti, VPT, 2016
5. Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series), Bart Baesens, John Wiley & Sons,2014

Sub Title: DESIGN AND ANALYSIS OF ALGORITHMS LAB	
Sub Code: CSUFLT1	**No. of Credits: 1.5=0: 0: 1.5(L-T-P)**
Exam Duration: 3 hours	**IA+ESE =25+25**

LAB OBJECTIVES:

1. Understand the recursive type algorithm with their data structure
2. Understand the divide and conquer (with recursive function) and greedy algorithm like merge sort, quick sort and single source shortest path
3. Understand the dynamic programming paradigm and analysis the single source and allpair shortest path algorithm
4. Understand the branch and bound technique ,heap and Fibonacci data structure to implement optimization and sorting problem
5. Analysis about some NP class problems

Unit No.	Syllabus Content	Number of Hours
I, II, III, IV and V	• Simulate the Stack data structure (recursion) and do the posteriori analysis. • Simulate BFS, DFS on Graph and estimate the running time. • Simulate Prim's and Kruskal's Algorithm and do the posteriori analysis • Simulate Dijkstra's algorithm and do the posteriori analysis • Simulate all pair shortest path problem and do the posteriori analysis • Simulate Bellman algorithm and do the posteriori analysis • Simulate of Huffman Tree and do the posteriori analysis • Simulate of check whether a given graph is connected or not using DFS method and do the posteriori analysis • Simulate of Heap Tree and heap sort and do the posteriori analysis • Simulate of N Queen's problem using Back Tracking and do the posteriori analysis • Simulate 0/1 Knapsack problem using Dynamic Programming and do the posteriori analysis • Simulate TSP problem using Dynamic Programming and do the posteriori analysis • Simulate fractional Knapsack problem and do the posteriori analysis • Simulate to find a subset sum of a given set of integer number and do the posteriori analysis • Simulate to detect the circle in graph by using DFS algorithm and do the posteriori analysis	18

LAB OUTCOMES: The students would have learnt

CO1: Implement recursive algorithm with array and stack data structure.
CO2: Various tools to simulate divide and conquer algorithm and greedy using graph and link list.
CO3: Dynamic programming to optimization type and decision type problems.
CO4: Implement some problems like data compression algorithm and sorting algorithm using tree, array etc.
CO5: Simulate and optimize some NP class problem like SAT, clique and TSP etc.

Text Books:

1. Introduction to Algorithm, Thomas H. Cormen, Charles E. Leiserson, Ronald Rivest, CliffordStein, Publisher PHI, ISBN 81-203-2141-3.
2. Algorithms, Sanjoy Dasgupta, Christos H. Papadimitriou and Umesh V. Vazirani, Tata McGraw-Hill, 2008.
3. Python Algorithms Mastering Basic Algorithms in the Python Language by Magnus Lie Hetland.
4. Algorithm Design, Jon Kleinberg and Éva Tardos, Pearson, 2005.

Reference Books:

1. Fundamentals of computer Algorithms, Horowitz, Sahani, Galgotia. 2nd Edition, 1998.ISBN 81-7515-257-5.
2. Data Structures and Algorithms Using Python Rance D. Necaise.

Sub Title: JAVA LAB	
Sub Code: CSUFLT2	**No. of Credits: 1.5=0: 0: 1.5(L-T-P)**
Exam Duration: 3 hours	**IA+ESE =25+25**

LAB OBJECTIVES:

1. To provide the knowledge of Basics of Java.
2. To learn the Concept of package and Applet in Java.
3. To develop an awareness of modern programming language.
4. Provide practical Knowledge and Skills for developing a program with java.
5. Develop ability to design a small software using java.

Unit No.	Syllabus Content	Number of Hours
I, II, III, IV and V	● Write a program to find a factorial of a given number. ● Write a program to show all relational and Logical operator. ● Write a program using Constructors ● Write any program using the concept of method overloading. ● Write a program to show the concept of Inheritance. ● Write a program to using 10 string operations ● Write a program using packages ● Write a program to show the concept of Synchronization in Multithreading. ● Write a program to show exception handling in java ● Write a program to show human face using Applets	18

Text Books:

1. Programming with Java A Primer, E. Balagurusamy, Fourth Edition, McGrawHill, 2010.

Reference Books:

1. Java TM 2: The Complete Reference, H.Schildt, Fourth Edition, Tata McGrawHill, 2001.
2. A Programmer's Guide to Java TM SCJP Certification A Comprehensive Primer, K. A. Mughal and R. W. Rasmussen, Third Edition, Addison Wesley, 2008.